



Risk Management Techniques: Do They Pay Off?

KEYWORDS

Derivatives, Hedger, Speculator, Arbitrageur, Currency Futures, Options, Swaps, Payoff

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ABSTRACT

"Risk comes from not knowing what you're doing" - very rightly said by Warren Buffet because risk is troublesome when one is unable to manage them. One thing can be done here that not to take risk. But risk avoidance is not the practical and possible way all the time and the person has to bear it. In such kind of situation risk management techniques are boon to the investors. In financial risk management derivatives play a significant role. In the present study the researcher has studied - Derivatives as a risk management technique.

The researcher has taken currency futures as the sample and explored how it can maximize the pay off or minimize the loss under the three market positions taken by the investor: Hedging, Arbitrage and speculation. The researcher has taken numeric examples and with hedging strategies and steps tested whether these techniques pay off or not. The researcher has formulated the research questions and through the calculation on the numerical data found that yes, the risk management technique pays off. The researcher has also tried to elaborate the types of derivatives and their implications in the present study.

As all medicines are for the betterment of health, but the medicine is to be given according to the disease to be cured same in case of risk management techniques. All the techniques are not useful in all the situations. It should be chosen by considering several factors. This decision making process can be perfect only by the knowledge and experience as the popular saying goes,

1. Introduction

"Risk comes from not knowing what you're doing." - Warren Buffet

Risk is inherent in all the activities we perform in our day-to-day life and all of us remain concerned about it. Risk can be defined as deviations of the actual results from the expected. Most of the people would like to live in a world of certainty and want to eliminate the risk. However it is not possible to eliminate the risk completely but by taking certain steps we can mitigate the risk to a considerable extent certainly.

The measures to mitigate risk are determined by the combined impact of the probability and magnitude of loss. On these bases the management of risk is viewed in two ways:

Category-1 Risk of small losses with high probability
Category-2 Risk of high losses with low probability

The category-1 includes the risk involved in changes in stock prices where the changes are small but occur frequently. In the category-2 there are earthquakes, tsunami, thefts which cause huge losses but probability of their occurrence is far lower.

2. Conceptual Framework

2.1 Potential risk treatments

Once risks have been identified and assessed, all techniques to manage the risk fall into one or more of these four major categories:

- (i) Risk Avoidance (eliminate, withdraw from or not become involved)
- (ii) Risk Reduction (optimize - mitigate)
- (iii) Risk Sharing (transfer - outsource or insure)
- (iv) Risk Retention (accept and budget)

In some cases risk avoidance is possible but not in all. One has to find better avenues to manage risk rather than avoidance of activity altogether. Other possible ways are reduction, transfer or retention of risk. Insurance is the most popular technique to transfer the risk. The other technique is known as risk diversification. Through the process of diversification one can reduce or budget is efficiently. Derivatives are the most important technique of diversification of risk.

2.2 Derivatives as Risk management technique

The markets for derivatives have been growing at a phenomenal pace. The variety of derivatives in terms of nature of products as well as underlying asset too has expanded greatly. **Commodity derivatives** naturally were the first amongst all classes of derivatives. Chicago Board of Trade (CBOT) provided the initial platform for buyers and sellers to enter forward contracts in 1864 and overcome the credit risk in the forward contracts. The development of derivative in India too is very old. Bombay Cotton Trade Association Ltd was set up in 1875 for futures trading in cotton.

Financial derivatives became popular only after the 1970s when there was increasing integration of the world economy. Increased globalization caused firms to expand business beyond their national boundaries. Chicago Board of Trade (CBOT) merged with Chicago Mercantile Exchange (CME) remains the largest exchange in the world for financial derivatives, both in terms of volume and value of derivatives contracts. In India derivatives trading is dominated at National Stock Exchange (NSE) which stands amongst the top ten exchanges in the world in terms of number of contracts traded.

3. Review of Literature

The researcher had reviewed finance literature on risk management for conceptual framework of the study. To know

about the gap in the source of knowledge and to find the area in which the least work has been done the researcher had also reviewed past studies. This helped her in selecting the present research topic and guided throughout the whole research work. Some of them are as follows:

Kogut (1985) analyzes diversification and operational flexibility as risk management tools of multinationals. He studied how operational flexibility and diversification change the risk profiles of firms. He found that an operational decision (the sourcing policy in this case) can create three different types of risk profile: **speculative, hedged and flexible**. The speculative profile is betting on one site mainly to benefit from economies of scale in operations. By matching the exchange rate exposure on the cost side with that on the profit side, the firm can create a hedged risk profile. This approach refers to the geographical diversification strategy has been discussed in the finance literature. Finally, a flexible risk profile created through operational flexibility permits the firm to exploit uncertainties by creating real options. Operational flexibility creates both arbitrage and leverage opportunities for multinationals.

Carter et al. (2003) studied operational hedging strategies as a combination of production and marketing strategies across the firm's operating units developed to manage long-term exposures. They discussed real option type operational hedging strategies such as shifting sourcing or production, exploiting growth-options, having pricing flexibility and abandoning foreign markets except geographical diversification. Observe that all of these strategies were again types of operational flexibility.

Triantis (2000), MacMinn (2002) found that risk management in the broad sense is not equivalent to risk hedging. Instead, it is the creation or preservation of firm value through managing exposures. They added that risk management without hedging is speculation with financial derivatives. In the finance literature, financial markets are assumed to be efficient and therefore there is typically no room for arbitrage. Nevertheless, when there are arbitrage opportunities, firms can choose to speculate on financial markets to create value (Moschini and Lapan 1995).

Ding and Kouvelis (2001), mentioned that since hedging is mitigating the risk exposure, one may expect an operational hedge to decrease this risk measure. As when the exchange rate and demand distributions are correlated, then the allocation option may in fact increase the variance of the firm's operating profits. In this case, not only the existence of additional operational decisions, but the use of variance as the risk measure drives this result: a measure of dispersion (variance, in this case) can be adopted as a risk measure only if the distribution is symmetric (Szego 2002). Moreover, variance is the perfect indicator of risk when comparing two normal or uniform distributions (Eeckhoudt and Gollier 1995, p.82); and is not applicable to news vendor-based models such as in Ding and Kouvelis (2001) and Van Mieghem (2003).

Stulz (1996) thought that the primary goal of corporate risk management programs is to eliminate the probability of costly lower-tail outcomes, i.e. the downside risk variance is also utilized as a risk measure (Chowdry and Howe 1999).

As per **Chen and Federgruen (2000), Gaur and Seshadri (2001)** the operations management literature has recently incorporated risk aversion through mean-variance type util-

ity functions and operational hedging has been analyzed in the mean-variance framework (Ding and Kouvelis 2001, Van Mieghem 2003).

4. Research Methodology

The researcher wanted to study about the effectiveness of derivatives. The researcher wanted to explore how the derivatives are useful to manage the financial risk. So the type of the present research is exploratory research. Moreover the researcher has analyzed the data on descriptive basis so it is also a descriptive research. There is also use of numerical analysis so on that perspective this is a quantitative research too.

4.1 Objectives of the study

The objectives of the present study are:

1. To know the concept of the derivatives.
2. To explore the types of derivatives and their uses in risk management.
3. To find how the derivatives can be implemented to minimize the financial risk.
4. To study the payoffs derived through the use of derivatives with practical examples and calculations.

4.2 Research Questions

The researcher had framed the following researcher questions:

1. How can hedger (importer) get significant payoff or reduce loss in long hedge position through currency futures?
2. How can hedger (exporter) get significant payoff or reduce loss in short hedge position through currency futures?
3. How can speculator get significant pay off through currency futures?
4. How can arbitrageur get significant pay off or reduce loss through currency futures?

4.3 Data collection

The researcher had collected data from books related to research methodology and for the conceptual frame work of the research topic. She had also referred journals, magazines, news papers and related websites too.

4.4 Population and Sample of study

In the population of the present study all types of derivatives have been included. The brief summary of these types are as follows:

Table-1
Classification of Derivative Contracts According to the Nature of the Derivative Instrument Itself

Derivatives without optionality are linearly related to the underlying	Derivatives with optionality have a non-linear relationship with the underlying	Some derivatives combine characteristics of different instruments
• Futures	• Options	• Hybrids
• Forwards	• Options on futures	• Embedded options
• Swaps	• Caps and floors on interest rates	
	• Options on swaps, caps and floors (swaption, caption, floorion)	

Table-2
Classification of Derivative Contracts According to the Nature of the Market in Which the Derivatives is Traded

Exchange traded derivatives	Over The Counter (OTC) derivatives
Futures contract on stocks, currencies and commodities	Forward contracts on stocks, currencies and commodities
Exchange traded options on stocks, currencies and commodities	OTC options on stocks, currencies and commodities
Swap note and interest rate futures	Interest rate swaps, caps, floors and forward rate agreements

Table-3
Classification of Derivative Contracts According to the Nature of the Underlying from Which the Derivative Derives its Value

Stocks	Foreign Exchange	Interest Rate/ Bonds/ Credit	Commodities	Natural phenomena
Single stock futures	Foreign exchange forward contracts	Bond futures and options	Futures and options on agricultural commodities like wheat, soyabean and milk	Weather derivatives related to rainfall and temperature
Single stock options	Currency futures	Forward rate agreements and interest rate futures	Energy derivatives like crude oil, natural gas and electricity	Derivatives related to natural calamities like earthquakes and hurricanes
Stock index futures	Currency options	Caps, floors, swaps and swaption	Future and options on precious metals like gold and silver	
Stock index option	Currency swaps	Credit default swaps and other credit derivatives	Futures and options on industrial metals like copper and aluminium	

All of the above types of derivatives are included in the population of present study. The researcher has selected **Currency Futures** as the sample of the study to see the effectiveness of derivatives.

4.5 Scope of the study

The researcher studied the effectiveness of derivatives under three types of the intentions of the investors. The investor can take anyone of the following three positions in the market. So the scope of the study is limited to the following:

4.5.1 Types of participants in derivatives markets

Participants in the derivative markets can be broadly classified in three depending upon their motives.

(i) Hedgers :- Hedgers are those who enter into a derivative contract with the objective of covering risk. A farmer growing wheat faces uncertainty about the price of his produce at the time of the harvest. Similarly, a flour mill needing wheat also faces uncertainty of price input. Both the farmer and flour mill can enter into a forward con-

tract where farmer apprehends price fall while the flour mill fears price rise. Both the parties face price risk. A forward contract would eliminate price risk for both the parties. Price risk being faced by farmers as well as the flour mill. Such participants in the derivative markets are called hedgers. The hedgers would like to conclude the contract with the delivery of the underlying assets. In the example the contract would be settled by the farmer delivering the wheat to the flour mill on the agreed date at an agreed price.

(ii) Speculators :- Speculators are those who enter into derivative contract to make profit by assuming risk. They have an independent view of future price behavior of the underlying asset and take appropriate position in derivatives with the intention of making profit later. Speculators perform an extremely important function. They render liquidity to the market. Without speculators in the market not only would it be difficult for hedgers to find matching parties but the hedge is likely to be far from being efficient.

(iii) Arbitrageurs :- Arbitrageurs perform the function of making the prices in different markets coverage and be in tandem with each other. While hedgers and speculators want to eliminate and assume risk respectively, the arbitrageurs take riskless position and yet earn profit. They constantly monitor the prices if different asset in different markets and identify opportunities to make profit that emanate from mispricing of products. An arbitrageur takes risk neutral position and makes profits because markets are imperfect.

4.6 DATA ANALYSIS AND INTERPRETATION

The researcher had taken numeric examples representing the different positions taken by an investor as data. She analyzed these data through risk management techniques. The speculation, arbitrage and hedging strategies are used as to analyze situation given in the examples. The interpretations had been derived from the results from these strategies.

5. Statistical/Numerical analysis of currency futures through different techniques of risk management

From the various types of alternatives as discussed earlier, here the currency futures are chosen as sample of the study. Here how different types of participants of market like hedgers, speculators and arbitrageur can generate payoff by taking minimum risk is explained by numerical examples.

5.1 Numerical Analysis through Hedging Strategies under different positions of investors in currency :

The following are two examples which will illustrate the mechanics of hedging through futures for exporter and importer known as long hedge and short hedge respectively.

(i) Hedge for importer – Long hedge

In June an Indian importer buys a machine at US dollar 10,000. Payment is due after six months in December. The spot exchange rate is Rs. 45.50 while December futures are trading at Rs. 46.60 indicating an appreciation of dollar by about 2.4% in six months. The importer feels that dollar will appreciate much more. What shall he do? Assume futures contract in rupees are available for 1,000 dollars.

Hedging strategy

As hedging strategy the importer buys the futures contract now selling at Rs. 46.60 and sells close to delivery date

before December. The importer knows the exact amount of dollar to be covered and therefore he buys 10 contracts on MCX-SX.

No. of contracts bought = Exposure amount/Value of one contract = 10,000/1000=10

Having bought 10 futures the importer would cancel the position in the futures by selling the futures at a date close to the actual date of payment in December.

Let us examine the two different scenarios of exchange rates at the time when the payment becomes due in December.

• When US dollar appreciates to Rs.47.50 and futures sells for Rs.47.55

The importer exits from futures contract at Rs.47.55 and buys the foreign currency in the spot market at the prevailing spot rate.

Importer buys 10,000 dollars at spot rate	Rs.
Cost=10,000*47.50	4,75,000
Sells 10 future contracts booked earlier at Rs.47.55	
Net gain on futures (47.55-46.60)*10,000	(9,500)
Net rupee amount paid	4,46,500
Effective exchange rate (4,46,500/10,000)	44.65
As against spot price of Rs. 47.50 the importer ends up buying dollar at Rs. 44.65.	

• When US dollar depreciates to Rs. 44.50 and futures sell for Rs. 44.55

Importer buys 10,000 dollars at spot rate	Rs.
Cost = 10,000* Rs. 44.50	4,45,000
Sell 10 future contracts at Rs. 44.55	
Net loss on futures (46.60-44.55)*10,000	20,500
Net rupee amount paid	4,65,500
Effective exchange rate (4,65,500/10,000)	46.55
As against spot price of Rs.44.50 the importer ends up buying dollar at Rs. 46.55.	

As against spot price of Rs.44.50 the importer ends up buying dollar at Rs. 46.55.

It may be observed that irrespective of appreciation or depreciation of US dollar the effective cost of buying dollars remains close to the opening futures price, i.e. Rs.46.60. the difference of actual cost and the futures price is on account of the differential of the spot price and futures price when hedge was lifted, as basis risk.

(ii) Hedge for exporter – short hedge

Its December now and a British exporter is expecting to receive 5 million US dollars in six months time in the coming June. He is expecting dollar to depreciate and pound to appreciate as is reflected in the spot and futures rates at Chicago Mercantile Exchange (CME) given below.

	Spot	June futures
Current	\$1.50/£	\$1.55/£
In June (prior to settlement)	\$1.62/£	\$1.63/£

Hedging strategy

Hedging strategy would involve selling the futures now and covering later. Exporter is facing loss in the receivable and he is long on dollar in the physical market and therefore he must short in the futures market, i.e. buy pounds and sell dollar.

Determining the number of contract to be traded:

Standard contract at CME in British pound is for £ 62,500.

Number of contracts to be purchased= \$ 2 million/1.5/62,500=21.33

Actual number of contracts purchased=21 (Rounded off)

Actions to be taken in June:

Exporter squares up and sells the future contract.

Gain on futures market =(1.63-1.55)*21*62,500=\$ 1,05,000

This is equivalent to £ 64,815. (1,05,000/1.62=64,815)

Loss on receivable = (1/1.50-1/1.62)*2 million= £ 98,765

Net loss = £ 98,765 - £ 64,815 = £ 33,950

If the exporter had not hedged he would have received £ 12,26,994 (20,00,000/1.63) and made loss of £ 98,765. With hedging he receives £ 64,815 extra from futures contract and can reduce his loss by 64,815 by having loss of only £ 33,950. The realization rate at \$ 1.63/£. [\$ 20,00,000/(£ 12,26,994 = \$1.63/£).

5.2 Numerical Analysis through speculation

Consider the following prices:

		US \$/SG \$
Spot:	(January)	0.6070
Futures:	March	0.6100
	June	0.6150
	December	0.6200

These rates imply that Singapore dollar (SG \$) will appreciate against US dollar. A speculator does not agree and believes that Singapore dollar would depreciate or will not appreciate as much. Therefore he sells September futures contract at 0.6220 for SG \$ 1,00,000.

However Singapore dollar does appreciate but not as much and on 1st September the rates are (US \$/SG \$):

Spot : 0.6150 and September futures : 0.6158

The speculator squares up his position by buying September contract and gains US dollar (0.6220-0.6158) = \$ 0.0062 per SG \$ or \$620 per contract (1,00,000 SG \$), ignoring the transaction cost. If SG \$ had been depreciated instead, the gain of speculator would have been even larger.

5.3 Numerical Analysis through Arbitrage strategy

□ Arbitrage Strategies

The steps to be taken are different in arbitrage as per the price of the future as follows:

When future is overpriced	When future is underpriced
Steps should be taken at current	Steps should be taken at current
Borrow local currency for period of futures maturity	Borrow foreign currency for period of futures maturity

Convert to foreign currency using spot market	Convert to local currency using spot market
Invest in foreign currency for the period of futures	Invest in local currency for the period of futures
Sell futures equal to the matured foreign currency investment	Buy futures equal to the matured local currency investment
At maturity of futures	At maturity of futures
Deliver foreign currency against the futures sold	Deliver local currency against the future sold
Receive local currency against the futures sold	Receive foreign currency against futures bought
Pay for the borrowed local currency	Pay for the borrowed foreign currency
Since futures are overpriced, received local currency would exceed the liability of borrowing.	Since futures are under-priced, received foreign currency would exceed the liability of borrowing.

Arbitrage technique to get significant pay off or loss reduction through currency futures

Following data from financial markets is available

Spot exchange rate (Rs./\$)	49.56
180-day futures	50.00
Rupee interest rate (T-bill yield)	12%
Dollar interest rate (T-bill yield)	6%
Fair price of future = spot * (1+ rupee interest rate*days/365)/(1+ dollar interest rate *days/365)	
= 49.56*(1+0.12*180/365)/(1+ 0.06*180/365)	
= Rs. 51.00	

Here 50.00 < 51.00 actual value < fair value, represents under price

So steps under the under-price situation should be followed:

Particulars	Cash flows	
	\$	Rs.
Now		
Borrow US dollar	1,000.00	
Convert to rupee using spot market	-1,000.00	49,560.00
Invest rupee at 12% for 180 days		-49,560.00
Buy dollar in futures maturing after 180 days worth Rs. 52492.87		
Cash flow at t = 0	0.00	0.00
At maturity		
Receive invested rupee [49,560+(49560*12%*180/365)]		52492.87
Deliver rupee against futures		-52492.87
Receive dollars against futures (52492.87/50.00)	1,049.84	
Pay dollar borrowed at 6% [1,000+(1,000*6%*180/365)]	-1,029.59	
Cash flow at maturity of futures	20.25	0.00

At maturity of futures contract the arbitrageur can make a profit of \$ 20.25 for every \$ 1,000 borrowed.

6. Findings

The derivatives are important technique to manage the risk. The researcher had found that derivatives are the tools to get maximum payoffs or to minimize the loss. From the numerical examples above it is found that hedging is very useful to minimize price risk. Arbitrage is the technique to get benefit from two different prices prevailing in two different markets of a single underlying. Moreover the expanding use of derivatives proves it's effectiveness.

Effectiveness of derivatives

(i) Use of derivatives by corporations

Company use currency forwards and other derivatives to hedge their exports, imports and other foreign exchange exposures. They use commodity derivatives to hedge raw material consumption and inventories as well as their output prices and inventories. For example, an electronic goods manufacturer might use copper futures to hedge the cost of copper which is a major raw material for it. A gold mining company might use gold futures to hedge the selling price of its output. Company interest rate derivatives to hedge their borrowing cost.

(ii) Use of derivatives by Mutual Funds and Investment Institutions

Investment institutions use currency forwards and other derivatives to hedge their international asset and liability portfolios. They use swaps and other interest rate derivatives to protect their portfolio from the effect of interest rate risk. They use commodity futures to invest in asset classes, in which they find it difficult to invest directly. Investment institutions also sell options to earn premium income and enhance the returns on the portfolio. Hedge funds and other aggressive investors use derivatives to speculate in various financial markets or to arbitrage between different markets.

(iii) Use of derivatives by Financial Service Firms, Banks and other Dealers

Banks and securities firms use derivatives to hedge their inventories of securities. For example, a stock might carry large inventories of shares as a part of his trading activities. He might use stock index futures to eliminate the market risk of these inventories. Banks often act as a dealer in derivative markets to earn dealer spread by buying a derivative from one customer and selling them to another at a higher price. They may also seek to make profits by carrying on arbitrage between different markets. Some firms may also speculate on different prices and earn trading profits by taking positions.

(iv) Use of derivatives by Individuals

Many individuals do speculate on asset prices. A famous example was the late Noble Prize winning economist, Milton Friedman who wanted to short sell the British pound in 1969 when his economic analysis convinced him that currency was imminent. He was unable to do so in the OTC markets available at the time and this experience made him a strong supporter of financial futures in Chicago.

Individuals who manage their own investment portfolios might also use derivatives for the same reasons as investment portfolios might also use derivatives for the same reasons as investment institutions. In addition, they may use derivatives to hedge their non-tradable assets. For example, an individual who holds non-transferable employee stock options granted by his employer might use derivatives to hedge the risk of these options.

7. Suggestions

The benefits of derivative flow from their liquidity, convenience and leverage. The same characteristics make derivatives attractive to rogue traders and aggressive investors seeking high returns through high risk strategies. The complexity of derivatives makes it difficult for senior management and external stakeholders to fully understand the strategies being used. All these factors play a role the derivatives disasters.

The principal lesson to be learnt from the disasters is that management must understand these characteristics and ensure that they have well-designed internal control system to ensure that derivative are appropriately used. The Board of Directors also has the responsibility to lay down risk management policies and ensure that these are adhered to. Regulators also may have a role in ensuring appropriate accounting and disclosure of derivative positions and in seeing to it that the Board and the top management take their roles seriously.

8. Conclusion

Derivatives facilitate the buying and selling of risk and many financial professionals consider this to have a positive impact on the economic system. Although someone loses money while someone else gains money with a derivative, under normal circumstances, trading in derivatives should not adversely affect the economic system because it is not zero sum in utility.

Derivatives, whether they are futures and options, or swaps and forwards, all require careful and deliberate study. In this field of greed and money, do indulge wisely. Futures and options trading is fantastic as a risk reducing measure (hedging) but may not be equally fantastic as a speculative bet, especially when you do not have the required expertise, neither in derivatives, nor in forecasting.

So, these were some basics regarding how a risk management process works. Depending on individual requirements and needs, it can always be customized provided you have enough knowledge and research data available at hand. **Because, as the popular saying goes,**

"Risk Varies Inversely with Knowledge"

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